

# Injuries Caused by Motor Vehicles

## A Statistical Analysis

MILFORD X. ANDERSON, M.D., Los Angeles

IN THE FIRST 55 years of this century, 1,149,414 persons in the United States died in highway accidents. In all the wars of this nation in the 180 years of its existence, only 1,130,393 men were killed.

In 1955<sup>1</sup> motor vehicle accidents took about 38,500 lives in the United States—about 2,500 more than in the preceding year and the highest number in 14 years. However, on the basis of miles traveled, the 1955 rate was about the same as that of the previous year. Each year 100,000 persons are permanently injured and another 1,200,000 are temporarily disabled as a result of traffic accidents.

Motor vehicles cause more than two-fifths of the total number of deaths that occur in all kinds of accidents and a far greater number than any other kind of accident.<sup>2</sup> For every person killed by a motor vehicle, about 35 are disabled, temporarily or permanently.

Among males in early life, more than one-half of all accidental deaths are caused by the automobile.<sup>2</sup>

Between eight hundred and a thousand deaths a year result from injuries to drivers and passengers of motorcycles involved in accidents.<sup>3</sup>

A few deaths occur among bicycle riders.

Recent stress on measures to prevent injury to both pedestrian and motor vehicle occupants seems to necessitate a close study to determine the nature, location and types of injuries in order to develop better preventive measures.

The National Safety Council<sup>4</sup> reported that in

Submitted May 14, 1956.

TABLE 1.—Data on Persons Received at Lincoln Heights Receiving Hospital After Injury in Traffic Accidents

Total patients treated at Lincoln Heights Receiving Hospital in one year, 1955.....	15,763
Total involved in traffic accidents.....	1,865
Passengers .....	1,587
Pedestrians .....	278
Dead on arrival or died in receiving hospital.....	15
Hospitalized for further care.....	338
Private hospitals .....	169
County hospital .....	169
Major injuries .....	352
Minor injuries .....	1,513
	1,865

• In an analysis of 6,024 injuries in 1,865 persons hurt or killed in traffic accidents, it was noted that the incidence of injuries to the head and lower extremities was 32 per cent in each instance. Twenty-five per cent of all fractures involved the head.

1949, 18 per cent of all drivers involved in fatal accidents had been drinking, compared with 17 per cent in 1950. Drivers under the "influence of alcohol" were reported in 8 per cent of all fatal cases in both 1949 and 1950.

Commissioner Donald S. Leonard of the Michigan State Police<sup>4</sup> stated that "there is good evidence that one-third of drivers involved in accidents resulting in personal injuries are under the influence of alcohol." The Northwestern University Traffic Institute showed that nearly one-half of the drivers involved in accidents had been drinking.

### MATERIAL AND METHODS

In the year 1955 there were 15,763 persons admitted to the Lincoln Heights branch of the Los Angeles receiving hospitals, 1,865 (12 per cent) of them because of injury in automobile accidents (Table 1). These patients constitute the material used in this study. Two hundred and seventy-eight were pedestrians and 1,587 were vehicle passengers. Fifteen patients were killed immediately or died very shortly after arriving at the emergency hospital and 338 persons were hospitalized for further care.

Almost 20 per cent of the persons in the present study who were injured enough to require medical care had been drinking. This figure is low compared to data in other series, for at the Lincoln

TABLE 2.—Incidence of Drinking in Persons Injured in Traffic Accidents

H.B.D.* .....	97
H.B.D., 1 plus.....	50
H.B.D., 2 plus.....	124
H.B.D., 3 plus.....	98
H.B.D., 4 plus.....	21
Total .....	390

\* Had been drinking.

TABLE 3.—Classification of Cases in Which Persons in Traffic Accidents Had Ingested Alcohol Previously\*

Classification	Gm. of Alcohol Per Kilogram of Brain	Percentage of Alcohol in Brain	Physiologic Effect
Trace .....	0.050 to 0.200	0.005 to 0.02	Normal
1 plus .....	0.200 to 1.000	0.02 to 0.10	Normal
Low 2 plus.....	1.000 to 1.500	0.10 to 0.15	Affected stage; may or may not be intoxicated
High 2 plus.....	1.500 to 2.500	0.15 to 0.25	Intoxicated
3 plus .....	2.500 to 4.000	0.25 to 0.40	Loss of equilibrium; intoxicated
4 plus .....	4.000 to 6.000	0.40 to 0.60	Unbalanced; intoxicated

\*Courtesy of William C. Wilentz, M.D. (Am. Pract. and Digest of Treatment 4:22, January, 1953).

Heights hospital patients with head injuries are usually not listed as "had been drinking" (H.B.D.) because it is hard to differentiate which symptoms are due to head injury and which to drinking. In many cases of only minor injuries no notation is made as to whether the patient had been drinking or not. Ninety-eight persons were classified as three plus H.B.D. (the scale is from 1 to 4) and 21 persons who had passed out completely were classified as four plus H.B.D. at the time of the accident (see Table 2).

The classification of drinking used at Lincoln Heights is purely a clinical one and is not correlated with the results of intoximeter tests done by the police.

It is believed, however, that the clinical evaluation will correspond closely with that of Wilentz, which is reproduced as Table 3.

Patients receiving emergency care at the receiving hospital are treated within 5 to 20 minutes of the time of the injury in most cases, and because of this there is a very small incidence of shock. It is felt, however, that many of the patients go into shock after leaving the receiving hospital. Cerebral concussion was over three times as common as shock (Table 4).

The various types of injuries were classified as contusions, abrasions, lacerations, fractures, hematomas, avulsions, ecchymoses, whiplash injury and others.

Injuries were also classified according to their anatomical location—head, neck, thorax, abdomen, shoulder, arm, elbow, forearm, hand, knee, thigh,

TABLE 4.—Incidence of Shock and Concussion in 1,865 Persons Admitted to Hospital Because of Injury in Traffic Accidents

Shock:	
Mild .....	19
Moderate .....	19
Severe .....	8
	46
Concussion cerebri:	
Mild .....	74
Moderate .....	75
Severe .....	9
	158

TABLE 5.—Kinds of Injuries in 1,865 Persons Admitted to Hospitals After Traffic Accidents

Contusions .....	2,004
Abrasions .....	1,964
Lacerations .....	843
Fractures .....	465
Hematomas .....	262
Sprains .....	209
Avulsions .....	67
Ecchymoses .....	50
Whiplash injuries .....	49
Internal injuries .....	20
Dislocations .....	10
Amputations .....	2
Teeth .....	29
Loose .....	14
Fracture .....	13
Absent .....	2
Miscellaneous* .....	70
Total injuries .....	6,024

\*Lumbrosacral sprain 1, sprained hip 1, contusions of sacrum 4, coccyx 3, iliac crest 22, buttocks 39.

TABLE 6.—Injuries to Head, Neck, Thoracic and Abdominal Regions in 1,865 Persons Admitted to Hospital After Traffic Accidents

	Contu- sions	Abra- sions	Lacera- tions	Hema- tomas	Frac- tures	Avul- sions	Ecchy- moses	Whiplash Injuries	Sprains	Internal Injuries	
Head.....	555	468	591	166	121	38	20	....	....	....	
Neck.....	11	8	11	1	14	1	....	49	57	....	
Thoracic.....	215	69	7	2	74	1	4	....	....	1	
Abdominal.....	49	15	2	2	18	....	1	....	....	14	
Totals.....	830	560	611	171	227	40	25	49	57	15	2608

TABLE 7.—Injuries to Upper Extremities in 1,865 Persons Admitted to Hospital After Traffic Accidents

	Contu- sions	Abra- sions	Lacera- tions	Hema- tomas	Frac- tures	Avul- sions	Eechy- moses	Sprains	Dislo- cations	Ampu- tations	
Shoulder.....	86	54	2	1	21	1	1	19	1	....	
Arm.....	66	61	12	7	19	2	5	2	....	....	
Elbow.....	101	159	29	4	10	2	1	5	1	....	
Forearm.....	79	110	20	10	30	3	....	16	1	....	
Hand.....	81	155	37	7	13	10	1	7	....	2	
Totals.....	413	539	100	29	93	18	8	49	3	2	1254

TABLE 8.—Injuries to Lower Extremities in 1,865 Persons Admitted to Hospital After Traffic Accidents

	Contu- sions	Abra- sions	Lacera- tions	Hema- tomas	Frac- tures	Avul- sions	Eechy- moses	Sprains	Disloca- tions	
Thigh.....	122	79	8	9	40	....	3	4	4	
Knee.....	299	482	62	15	21	2	4	13	....	
Leg.....	165	174	34	28	59	2	9	2	....	
Ankles.....	59	69	8	6	24	2	....	24	2	
Feet.....	42	28	8	4	8	3	1	5	1	
Totals.....	687	832	120	62	152	9	17	48	7	1934

TABLE 9.—Injuries to Spinous Region in 1,865 Persons Admitted to Hospital After Traffic Accidents

	Contu- sions	Abra- sions	Lacera- tions	Frac- tures	Whiplash Injuries	Sprains	
Cervical .....	2	....	....	14	49	7	
Thoracic .....	18	8	2	6	....	9	
Lumbar .....	54	25	1	7	....	39	
Totals .....	74	33	3	27	49	55	241

leg, ankle and feet. Injuries to the spinal region were listed as cervical, thoracic or lumbar (only one classification for each patient).

Multiple injuries of the same type within one body region, such as abrasions or contusions of both arms, or both shoulders or both knees were recorded as a single injury.

The diagnosis of fracture was a clinical one, as x-ray films are not taken at the emergency hospital. The diagnosis of fracture was no doubt proved by x-ray in most of these patients, and fractures not suspected at the time of emergency treatment were no doubt found later by x-ray examination.

A total of 6,024 injuries was noted in the 1,865 patients treated. A compilation of the types of injuries in relation to the various parts of the body affected is listed in Tables 6, 7, 8 and 9.

About 66 per cent of all the injuries were contusions and abrasions. Lacerations, fractures, hematomas, sprains etc. made up the other 34 per cent. About 33 per cent of the total were head injuries. The lower extremities received 53 per cent more injuries than the upper.

A total of 472 fractures were suspected—420 simple, 44 compound and 8 fracture-dislocation. The

TABLE 10.—Distribution of Fractures in 1,865 Persons Admitted to Hospital After Traffic Accidents

	Simple	Compound	Fracture Dislocation	
Skull fracture .....	78	....	....	
Fractured nose .....	22	3	....	
Fractured jaw .....	16	2	....	
Fractured clavicle .....	17	....	....	
Fractured scapula .....	4	....	....	
Fractured humerus .....	17	2	....	
Fractured elbow .....	10	....	....	
Fractured forearm, one bone .....	25	....	2*	
Fractured forearm, two bones .....	3	....	....	
Fractured hand .....	11	2	....	
Fractured sternum .....	5	....	....	
Fractured ribs .....	63	....	....	
Fractured pelvis .....	11	....	....	
Fractured femur .....	36	3	1	
Fractured patella .....	10	1	....	
Fractured knee .....	9	1	....	
Fractured leg .....	31	28	....	
Fractured ankle .....	20	1	3	
Fractured foot .....	5	1	2	
Spinal fractures:				
Cervical .....	14	....	....	
Thoracic .....	6	....	....	
Lumbar .....	7	....	....	
Totals .....	420	44	8	472

\*Radius.

anatomical location of fractures is shown in Table 10. Of the total number of fractures, 121 involved the head.

In addition there were six dislocations and two acromioclavicular separations. There were two amputations of a finger. Broken teeth were associated with contusions and abrasions of the head and neck in 13 instances. In addition there were 14 loose teeth and in two instances teeth were missing.

#### DISCUSSION

The great preponderance of head and lower extremity injuries illustrates once more the necessity for some device to hold the person firmly in the vehicle. At present, seat belts are no doubt the most practical means. However, in the near future shoulder harness and other more effective means of stabilization will no doubt become available.

It is very seldom that passengers are killed who remain in the vehicle at the time of the accident. The incidence of serious injuries and death can no doubt be greatly reduced by means of better engineering of automobiles. The elimination of projecting handles on the sides and on the dash and better padding of the interior would eliminate many injuries.

3741 Stocker Street, Los Angeles 8.

#### REFERENCES

1. Accidental Deaths Rise in 1955, Stat. Bull. Metropolitan Life Insurance Co., 36:5-7, Dec. 1955.
2. Motor Vehicle Accident Problem, Stat. Bull. Metropolitan Life Insurance Co., 35:5-8, Jan. 1954.
3. Motorcycle Accident Fatalities, Stat. Bull. Metropolitan Life Insurance Co., 36:9-11, Sept. 1955.
4. Wilentz, William C.: The alcohol factor in violent deaths, Amer. Prac. Dig. Treat., 4:21-24, Jan. 1953.

